

Effect of Mechanical Processing on the Utilization of Whole-Plant Corn Silage by Lactating Dairy Cows

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Introduction

Corn silage harvested at a maturity greater than 2/3 milk line (less than 60% whole-plant moisture) results in reduced milk yield mostly due to inefficient starch utilization in the rumen. Breaking of whole corn kernels in corn silage can decrease the passage of undigested starch to the manure. The objectives of this experiment were to examine the effect of rolling corn silage on silage composition, intake, total nutrient digestibilities, milk production, milk composition, and body weight gain of lactating dairy cows.

Materials and Methods

Corn silage was harvested at the 1/2 milk line stage of kernel maturity with or without rolling using a John Deere self propelled chopper. Theoretical length of cut was increased with the rolled silage to give similar mean particle length for the rolled (9.8 mm) and unrolled (9.9 mm) silages. Twenty-nine multiparous (47 days in milk) and thirteen primiparous (52 days in milk) Holstein cows were randomly divided between the two groups. A 2-wk covariant adjustment period preceded a 16-wk experimental period. Diets (Table 1) consisted of 50% forage (2/3 corn silage: 1/3 alfalfa silage) and 50% concentrate (DM basis). Dry matter intake and milk production were recorded daily. Milk composition was determined from biweekly a.m. and p.m. samples. Total tract nutrient digestibility was determined once during the 8th week of the experiment using ytterbium as an external marker.

Results and Conclusions

Overall, results indicate that mechanical rolling of corn silage did not improve performance of lactating dairy cows in this experiment (Table 3). The high proportion of broken kernels in the control (82%) relative to the rolled corn silage (99%) may have been responsible for this. Although starch digestibility was improved with roller milling, the small proportion of unbroken

kernels in the control silage may have precluded a better response in this trial. There was no effect of corn silage processing on body condition or body weight change in this experiment.

Table 1. Ingredient and chemical composition of diets.

Ingredient	% DM basis	
	Control	Rolled
Alfalfa silage	16.0	16.0
Control corn silage	34.0	-
Rolled corn silage	-	34.0
High moisture ear corn	27.0	27.0
Roasted soybeans	12.0	12.0
Soybean meal	8.0	8.0
Limestone	1.0	1.0
Dicalcium phosphate	.7	.7
MgO	.2	.2
Trace mineralized salt	.5	.5
Sodium bicarbonate	.6	.6
Chemical composition		
Crude protein	16.2	16.3
ADF	16.7	16.9
NDF	27.8	28.4
Starch	24.7	25.2

Table 2. Chemical composition of control and rolled silages.

	Control	Rolled
Moisture		
Ensiled	62.5	62.7
Fresh	64.8	61.5
% of DM		
Crude Protein	7.1	7.0
NDF	39.4	38.2
ADF	23.7	23.0
Starch	24.5	23.2

Table 3. Dry matter intake, milk yield, milk composition and yield, and nutrient digestibilities.

	Control	Rolled	P <
Dry matter intake, kg/d			
Primiparous	21.9	21.9	NS
Multiparous	26.6	26.5	NS
Milk yield, kg			
Primiparous	37.5	35.4	.01
Multiparous	44.2	43.6	NS
Milk fat, %			
Primiparous	3.51	4.12	.01
Multiparous	3.66	3.76	NS
Milk fat, kg/d			
Primiparous	1.37	1.45	NS
Multiparous	1.60	1.65	NS
Milk protein, %			
Primiparous	3.22	3.14	NS
Multiparous	2.99	3.06	.09
Milk protein, kg/d			
Primiparous	1.23	1.12	.05
Multiparous	1.32	1.33	NS
Starch Digestibility, %			
Primiparous	85.6	86.6	NS
Multiparous	83.8	87.9	.09